Remarks

In view of the following remarks, favorable reconsideration of the outstanding office action is respectfully requested. Claims 1 – 55 remain in this application.

1. Allowed Claims/Subject Matter

Applicant notes with appreciation that the Examiner has indicated the subject matter of claims 15 – 23, 44, and 46 – 55 is patentable, and would be allowable if rewritten in independent form.

2. § 102 Rejections

The Examiner has rejected claims 1, 3, 4, 7, 11, 13, 26 – 30, 36, 37, 41, and 42 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,659,453 to Russell et al. [hereinafter Russell]. The Applicants respectfully traverse the rejection because the Examiner has failed to make a prima facie case of anticipation, since he has failed to show where each element can be found in the cited reference.

Claim 1 is directed to an arc fault detector for a power line system. The arc fault detector includes an upstream/downstream discriminator circuit. The discriminator circuit detects current fluctuations in at least one current characteristic of a load current and voltage fluctuations in at least one voltage characteristic of a line voltage. The discriminator circuit detects an upstream transient event when the current fluctuations and the voltage fluctuations are in phase. The discriminator circuit detects a downstream transient event when the current fluctuations and the voltage fluctuations are out of phase.

Claim 11 is directed to an arc fault protection device that is protective of a branch circuit portion of a power line electrical distribution system and connected to a load. The arc fault protection device includes a first sensor for detecting current fluctuations in at least one current characteristic of load current. The device also includes a second sensor for detecting voltage fluctuations in at least one voltage characteristic of a line voltage. A discriminator for comparing the polarities of the voltage fluctuations and the current fluctuations is also included. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Claim 41 is directed to an arc fault protection device that is protective of a branch circuit portion of a power line electrical distribution system and connected to a load. The arc fault protection device includes means for detecting current fluctuations in at least one current characteristic of a load current. The device also includes means for detecting voltage fluctuations in at least one voltage characteristic of a line voltage. Means for comparing the polarities of the voltage fluctuations and the current fluctuations is also included. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Claim 42 is directed to a method for protecting a branch circuit portion of an electrical distribution system from an arc fault, the branch circuit portion is connected to a load. The method includes the steps of: detecting current fluctuations in at least one current characteristic of load current; detecting voltage fluctuations in at least one voltage characteristic of a line voltage; and comparing the polarities of the voltage fluctuations and the current fluctuations. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Russell is directed to a method and apparatus for detecting an arcing fault on a power feeder line 12. Feeder line 12, which may deliver power over three phase lines, known as phases A, B, and C, which are 120 degrees apart in phase. Col. 3, lines 40 – 47. Russell determines the "X-indicator" for each phase line (A, B, or C). The X-indicator is determined for each phase line (i.e., X_A, X_B, and X_C) by calculating the numerical correlation to a model function stored within a model function portion 104. The model function may be stored as a current "I_F," which may be determined empirically, be simulated, or determined mathematically using known analysis programs. Col. 7, lines, 31 – 60, and Figure 3. Russell then attempts to determine which phase line (A, B, or C) is faulted. This is done by determining which phase X-indicator is significantly greater then the others. For example, if the absolute value of X_A is significantly greater than both X_B and X_C, then phase line A is determined to be faulted. Col. 8, lines 17 – 30. Finally, if $X_A > 0$, then Russell determines that the direction of the fault is forward. Col. 8, lines 40 – 54.

According to **MPEP 2131**, "to anticipate a claim, the reference must teach every element of the claim." A claim is anticipated only if each and every element as set forth in the

claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The Examiner states that Russell discloses a method and apparatus "that...detects load current fluctuations and line voltage fluctuations (col. 4, lines 1 – 5), detects an upstream event when fluctuations are in phase and detects a downstream transient event when fluctuations are out of phase (column 2 lines 38 – 47)." The Applicants respectfully assert that the Examiner's characterization of Russell is inaccurate.

While Russell does monitor load current and line-to-neutral (phase) voltages, Russell does not disclose an apparatus that "detects an upstream event when fluctuations are in phase and detects a downstream transient event when fluctuations are out of phase," as the Examiner suggests. The text in column 2 states:

> "If the faulted phase has been identified, the system also determines the location of the arcing fault relative to a monitoring point on the power line. If the X-indicator of the faulted phase is positive, then the fault is located downstream, toward the customer, from the measuring point, and upstream toward the generating station if the X-indicator is negative."

As noted above in the discussion of Russell, the "faulted phase" does not involve any comparison of the phase of the load current with the phase of the line voltage, but rather, it refers to one of the lines in a three-phase system. In particular, feeder line 12 is configured to deliver power over three phase lines, known as phase lines A, B, and C. Each of these lines are 120 degrees apart in phase. See col. 3, lines 40 – 47.

Russell includes a detector for monitoring various signals such as line-to-line voltages, line-to-neutral voltages, or load current flowing through feeder line 12. A transducer 30 produces parameter signals. See col. 3, line 57 – col. 4, line 23. The parameter signals are employed to produce an "X-indicator." However, the X-indicator is not a comparison of the load current phase with the line voltage phase. The X-indicator is determined for each phase line (i.e., X_A, X_B, and X_C) by *calculating the numerical correlation to a model function stored within a model function portion 104*. The model function may be stored as a current "I_F," which may be determined empirically, be simulated, or determined mathematically using known analysis programs. Col. 7, lines, 31 – 60, and Figure 3. The X-indicator compares one or more measured parameters *with a previously stored model function*. Thus, the X-indicator does not compare line voltage with load current.

The faulted phase line (A, B, or C) is identified by determining which phase X-indicator is significantly greater than the others. For example, if the absolute value of X_A is

significantly greater than both X_B and X_C, then phase line A is determined to be faulted. Col. 8, lines 17 – 30. Finally, if $X_A > 0$, then Russell determines that the direction of the fault is forward. Col. 8, lines 40 – 54. As such, the term "faulted phase," which is found in the text cited by the Examiner (Col. 2, lines 38 – 47) refers to a line in a three phase system, not a comparison of the line voltage phase with the load voltage phase.

In light of the above, the Examiner does not point out where Russell discloses a discriminator circuit for "detecting an upstream transient event when said current fluctuations and said voltage fluctuations are in phase, and said discriminator circuit detecting a downstream transient event when said current fluctuations and said voltage fluctuations are out of phase," as recited in claim 1. Nor does the Examiner point out where Russell discloses "a discriminator for comparing the polarities of said voltage fluctuations and said current fluctuations, wherein said comparison indicates whether an arc fault or arc mimicking noise is located in said branch circuit portion or located in a remainder of said electrical distribution system based on the comparison of the polarities," as recited in claim 11. The Examiner also does not show where Russell discloses "means for comparing the polarities of said voltage fluctuations and said current fluctuations, wherein said comparison indicates whether an arc fault or arc mimicking noise is located in said branch circuit portion or located in a remainder of said electrical distribution system based on the comparison of the polarities," as recited in claim 41. Finally, the Examiner fails to show where Russell discloses the step of comparing the polarities of line voltage fluctuations and load current fluctuations, "wherein said comparison indicates whether an arc fault or arc mimicking noise is located in said branch circuit portion or located in a remainder of said electrical distribution system based on the comparison of the polarities," as recited in claim 42.

Accordingly, the Examiner has failed to make a prima facie case of anticipation because the Examiner has not shown where Russell disclose every element of claim 1, claim 11, claim 41, and claim 42. The dependent claims are patentable in their own right, and also by virtue of their dependency from the independent claims. As such, the Applicants respectfully assert that claims 1, 3, 4, 7, 11, 13, 26 – 30, 36, 37, 41, and 42 are patentable under 35 U.S.C. § 102(b), and request that the rejection of claims 1, 3, 4, 7, 11, 13, 26 – 30, 36, 37, 41, and 42 under 35 U.S.C. § 102(b) be withdrawn.

3. § 103 Rejections

The Examiner has rejected claims 2, 6, 24, 25, 33, 38 – 40, 43, and 45 under 35 U.S.C. § 103 as being unpatentable for obviousness over Russell in view of U.S. Patent No. 5,439,509 to Blades.

Blades is directed to an arc detector for detecting potentially hazardous arcing in electrical connections comprises detection and signal processing circuitry for monitoring high-frequency noise characteristic of arcing on the power line and distinguishable from other sources of high-frequency noise.

According to the **MPEP 2143**, three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

A. The prior art references do not teach or suggest all the claim limitations.

Dependent claims 2, 6, 24, 25, 33, 38 – 40, 43, and 45 are patentable by virtue of their dependency from their respective independent claims. Blades does not supply the features missing from Russell.

B. There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine reference teachings.

According to MPEP 2143.01, if a proposed combination of the prior art would change the principle of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 123 USPQ 349 (CCPA 1959). Russell detects arc faults by comparing measured parameters with a model function stored in memory. Blades, on the other hand, detects arc faults by measuring high frequency noise, and comparing the high frequency noise to a predetermined threshold. One skilled in

the art would not combine Blades with Russell because the combination would change the principle of operation of Russell from a system that compares measured parameters with a model function stored, to a system that compares the amount of high frequency noise in a signal to a predetermined threshold.

Accordingly, the Examiner does not make a prima facie case of obviousness because the combination of Russell and Blades does not teach or suggest all the claim limitations. Further, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine reference teachings. As such, the Applicants respectfully assert that claims 2, 6, 24, 25, 33, 38 – 40, 43, and 45 are patentable under 35 U.S.C. § 103(a), and request that the rejection of claims 2, 6, 24, 25, 33, 38 – 40, 43, and 45 under 35 U.S.C. § 103(a) be withdrawn.

4. Conclusion

Based upon the remarks and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests reconsideration of the pending claims 1 – 55 and a prompt Notice of Allowance thereon.

Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Response timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account **50-0289**.

Please direct any questions or comments to Daniel P. Malley at (607) 256-7307.

Respectfully submitted,

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